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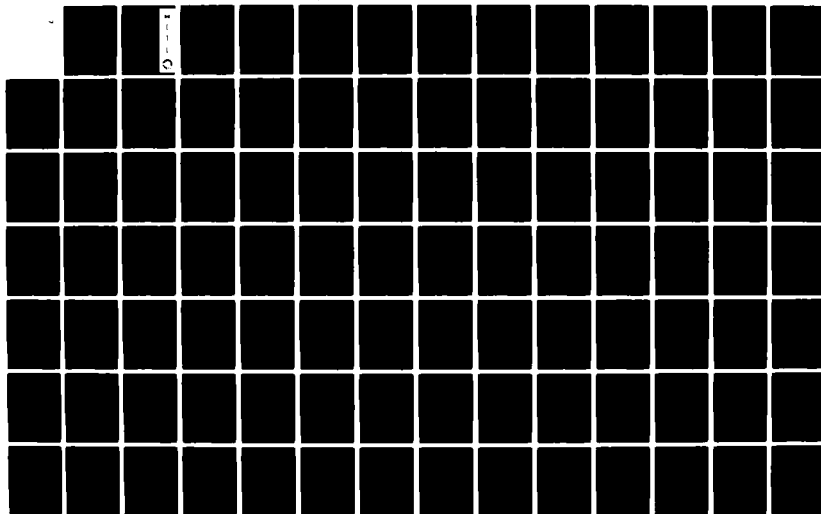
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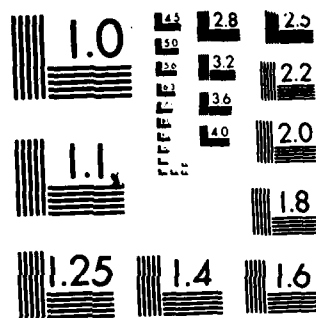
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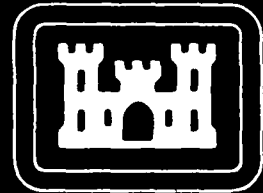
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Author and title indexes are provided for the ETL "Bibliographies of In-House and Contract Reports." The indexes are designed to be used in conjunction with the 12 published bibliographies and refer to them by year and page: AD-877 653L (1970); AD-890 066L (1971); AD-905 548L (1972); AD-B005 275L (1975); AD-B010 642L (1976); AD-B019 966L (1977); AD-A055 468 (1978); AD-A068 744 (1979); AD-A084 111 (1980); AD-A099 803 (1981); AD-A113 006 (1982); AD-A128 400 (1983).  The indexes were prepared by the staff of the Scientific and Technical Information Center.		

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## PREFACE

X This is Supplement 12 to the report titled "Bibliography of In-House and Contract Reports" (AD-877 653L), (Supplement 1, AD-890 066L), (Supplement 2, AD-905 548L), (Supplement 3, AD-B005 275L), (Supplement 4, AD-B010 6421), (Supplement 5, AD-B019 966L), (Supplement 6, AD-A055 468), (Supplement 7, AD-A068 744), (Supplement 8, AD-A084 111), (Supplement 9, AD-A099 803), (Supplement 10, AD-A113 006), (Supplement 11, AD-A128 400). It is a continuing bibliography of reports prepared by and for the U.S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, VA. This bibliography includes reports that were published from 1 January 1983 through 31 December 1983.

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COL Edward K. Wintz, CE was Commander and Director, and Mr. Walter E. Boge, was Technical Director of the Engineer Topographic Laboratories during the report preparation.

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Karow, Kenneth

**ADVANCE EDIT SYSTEM**  
January 1983

Sonicraft, Inc.

DAAK70-79-C-0180

**Keywords:** Automated Cartography, Digital Data Editing, Interactive Graphics.

An advanced edit system with high resolution interactive graphic workstations and support software for editing digital cartographic and mapping data was developed for ETL to be used by Defense Mapping Agency Aerospace Center (DMAAC). The hardware consists of PDP-11/70 computer with two Intergraph Corp. dual screen workstations; one has vector storage tubes; the other workstation has a raster color display with 1024 by 1024 pixels.

Conversion software programs were developed to convert AGDS Scan Data, CRT Printhead data, Gerber plot data, DLMS Culture and Terrain data, and RAPS data (various cartographic data base and plotter data instructions) into the Intergraph design file data format for display and editing. Additional programs convert the design file data back to the various data bases or plotter instructions.

Numerous interactive graphic manipulation commands are provided as a starting point for developing special commands to move, delete, add, or copy features in a design file.



ETL-0303

AD-A131 286

Cushman, S.F.  
Heller, W.G.  
LeSchack, A.R.

**ASSESSMENT OF MEANS FOR  
DETERMINING DEFLECTION OF  
THE VERTICAL  
August 1982**

The Analytic Sciences Corporation

DAAK70-82-C-0011

**Keywords:** Astrogeodetic surveys, Astrolabes, Deflection of the vertical, Gravimetric techniques, Gravity anomalies, Horrebow-Talcott method, Photographic zenith tubes, Sterneck's method, Theodolites.

This Interim Technical Report documents the first phase of a study of methods for determining deflections of the vertical. In this phase, the astrogeodetic and gravimetric methods have been examined. The objectives of these investigations have been: assessment of the accuracy of alternative astrogeodetic procedures; identification and analysis of potential improvements in astrogeodetic instrumentation; documentation of the gravimetric method and identification of achievable accuracy; development of error models for astrogeodetic and gravimetric techniques.

The second phase of this program will address techniques for determining deflections of the vertical from combinations of astrogeodetic, gravimetric, inertial, and gradiometric techniques.

ETL-0306

AD-A128 634

Lambert, Steven R.

**MODIFICATION OF THE MUSAT  
AEROTRIANGULATION PROGRAMS TO  
ACCOMMODATE BATHYMETRIC  
IMAGE POINTS  
May 1983**

Autometric Inc.

DAAK70-79-C-0158

**Keywords:** AS-11 compilation, Bathymetric data collection, Bathymetric mapping, Bathymetric triangulation, MUSAT-IIA, MUSAT-IIIA.

This Final Report presents the results of the modifications to the MUSAT aerotriangulation programs to accommodate bathymetric image points. This report develops the mathematical models for the two-media refraction problem encountered in bathymetric mapping. This report also presents the results of the modification of the AS-11 frame compilation program for the compilation of bathymetric data. The modified programs have been installed and tested at DMAH/TC, Washington, D.C.

Bose, S.C.  
Brockstein, A.J.  
Huddle, J.R.  
Wei, S.Y.

DEVELOPMENT, TEST, PREPARATION,  
DELIVERY, AND INSTALLATION OF  
ALGORITHMS FOR OPTIMAL ADJUSTMENT  
OF INERTIAL SURVEY DATA  
December 1982

Litton Guidance and Control Systems

DAAK-70-81-C-0082

**Keywords:** Collocation, Gravity vector estimation, Inertial System Modeling, Inertial Surveying, Least Squares, Position Estimation, Simulation of Inertial Survey Systems, Two-Dimensional Smoothing.

This report documents the development and testing of algorithms for optimal adjustment of inertial survey data for the three components of position (latitude, longitude, elevation) and the three components of the gravity vector (E-W and N-S deflection, disturbance). These data result from redundant information obtained at exterior (fully observed) and interior (partially observed) control points as well as at intersection/repeat points.

The (off-line) smoother software generated has minimal impact on the existing on-line Kalman filter program. The software consists of various modules that correct for systematic error sources not modeled in the Kalman filter. The corrections result in minimum variance estimates of the position and gravity values at each mark point via least squares. At intersection points the program produces unique position and gravity estimates. Additionally, the gravity deflections and disturbance are sent to a regional gravity smoother for further smoothing using collocation theory, resulting in consistent estimates based upon a stochastic disturbance potential model.

The software has been simulated in detail. The on-line response due to each significant error source is sent to the smoother modules and the results root sum squared to form a composite result due to all error sources. Results after smoothing show that performance with respect to closure points is less than 2.2 cm and 1.6 cm for level position/axis and elevation, respectively, and is less than 0.25 sec and 1.1 mgal for deflection/axis and disturbance, respectively.

A list of real world considerations as well as recommendations for future study concludes the report.

ETL-0309

AD-A127 508

Roof, Edward F.

**INERTIAL SURVEY APPLICATIONS TO  
CIVIL WORKS  
January 1983**

**Keywords:** Inertial Survey Systems, Inertial Measuring Units, Reference Frames, System Modules, System Operation, System Accuracies, Operational Results.

This report contains a basic explanation of inertial survey systems presently being used; Operational results in their use and an analysis of their potential use by the Corps of Engineers in support of Civil Works projects.

ETL-0311

AD-A123 452

Tazelaar, James

**TERRAIN ANALYSIS PROCEDURAL GUIDE  
FOR RAILROADS  
(Report No. 10 in the ETL Series on Guides  
for Army Terrain Analysts)  
December 1982**

**Keywords:** Data Elements, Data Fields, Factor Overlays, Military Geographic Information, Terrain Analysis.

This report provides U.S. Army Terrain Analysts with methods and procedures to produce railroad factor overlays and accompanying data tables from available sources such as maps, aerial photographs, and literature.

ETL-0312

AD-A126 829

Heydt, Howard L.  
O'Connell, Richard A.  
Wescott, Thomas F.

**INTERACTIVE IMAGE ANALYSIS  
SYSTEM DESIGN  
December 1982**

General Electric Company  
(Space Systems Division)

DAAK70-79-C-0153

**Keywords:** Digital Image, Image Processing, Interactive Analysis, Terrain Analysis.

This report presents requirements analysis and a system design for an interactive image analysis system capable of performing the Terrain Data Extraction process, which is described in detail in report ETL-0241 and others. The system is based on a VAX 11/750 minicomputer with a DeAnza IP8500 image display terminal. Commercially available, state-of-the-art hardware is defined yielding a cost effective reliable system fully capable of performing the terrain data extraction process.

ETL-0313

AD-A129 598

Robertson, Kenneth

**AN INSTRUMENT TO MONITOR THE  
TILT OF LARGE STRUCTURES  
April 1983**

**Keywords:** Autocollimation, Automatic Level, Dam Instrumentation, Dam Safety, Tilt Measurements.

The long-term or short-term tilt of structures such as locks or dams may be measured with an automatic level that has been temporarily modified for the purpose. The modifications consist of the addition of an autocollimating eyepiece and an optical vernier. A calibration mirror is also required for the measurement of long-term tilt. Accuracies of 1 to 5 seconds of tilt may be obtained.

ETL-0314

AD-A128 412

Heller, W.G.  
MacNichol, K.B.

**MULTISENSOR APPROACHES FOR  
DETERMINING DEFLECTIONS OF THE VERTICAL**  
January 1983

The Analytic Sciences Corporation

DAAK70-82-C-0011

**Keywords:** Astrogeodetic surveys, Astrogravimetric, Astrolabe, Deflection of the Vertical, Gradiometer, Gravimetric techniques, Gravity anomalies, Inertial Survey, Multisensor, Theodolite.

This final report documents the second phase of a study of methods for determining deflections of the vertical. In this phase multisensor techniques involving astrogeodetic, gravimetric, inertial, and gradiometric methods have been examined. The combination approaches discussed herein are those found to offer most promise in terms of accuracy, logistical convenience, and/or cost. Specific techniques treated in detail are the astrogeodetic method approached from a minimum variance estimation context, alternative moving base measurement techniques using supplemental astrogeodetic data, and regional adjustment of multiple tracks of inertial survey system measurements. Cost and logistical considerations for key single and multisensor deflection determination alternatives are reviewed.

ETL-0315

AD-A128 394

Chen, Pi-Fuay

**PRELIMINARY RADAR FEATURE EXTRACTION  
AND RECOGNITION USING  
TEXTURE MEASUREMENT**  
January 1983

**Keywords:** Classifiers, Feature Extraction, Image Texture, Radar Images, Solid-State Arrays.

Preliminary results are presented for the automated extraction and classification of a selected set of radar imagery containing city, field, water, and forest images. A sensing array minicomputer system with image texture processing algorithm was employed for the scanning and conversion of radar images into digital signals and also for the extraction of a feature vector from the images. A sequential template-matching classifier was used for the classification of the set of radar imagery into preassigned categories. Slightly better than 90 percent classification accuracy was obtained.

ETL-0316

AD-A128 401

Crombie, Michael A.  
Benson, Jean M.

AN EXTENSION OF KENDALL'S  
CONCORDANCE TEST WHERE TIES  
ARE ALLOWED  
February 1983

**Keywords:** Kendall's Concordance Test, J-Statistic, Monte Carlo.

Probability tables are given that will allow the user to test the hypothesis of random ranking of  $M$  items by  $N$  judges. The tables pertain to a limited number of values of  $N$  and  $M$  and, unlike Kendall's concordance tests, ties are allowed.

ETL-0317

AD-A128 395

Cervarich, Peter J.  
Dere, Donald P.

CIRCUMPOLAR METHOD FOR  
DETERMINING AZIMUTH  
February 1983

**Keywords:** Aiming Circle, Artillery Positioning, Azimuth, 43 Cephei, Circumpolar, Orthogonality, Plumbline, Reticle,  $\alpha$  Ursae Minoris,  $\delta$  Ursae Minoris.

A new reticle, designed especially for the M2-A2 Aiming Circle, enables an operator to determine north without the need for star tables, timing equipment, or computations. This method uses three circumpolar stars:  $\alpha$  Ursae Minoris,  $\delta$  Ursae Minoris, and 43 Cephei. The reticle has three concentric circles, one for each star. When the aiming circle's telescope is adjusted so that the circles are positioned on their respective stars, the telescope is alined north. The azimuth to a ground object can then be determined with the aiming circle. A similar reticle has been designed for use in the southern hemisphere. This method requires less than 2 minutes, providing an error of less than 2 mils, and only 20 minutes additional training for operators of the M2-A2 Aiming Circle.

**L.N.K. SOFTWARE SYSTEMS FOR TRANSFERRING,  
MERGING, AND DISPLAYING DFAD/DTED DATA ON  
AMS/CAPIR  
February 1983**

L.N.K. Corporation

DACA76-81-C-0005

**Keywords:** Cartography, Database, Data Structure, Digital Graphics, Digitizing, Geography, Graphics Superimpositioning, Minicomputer, Photo Interpretation, Spatial Data, Topological Validity.

This document describes a software system developed by L.N.K. Corporation under contract DACA76-81-C-0005 for interfacing Digital Land Mass System (DLMS) data with the Computer Assisted Photo Interpretation Research (CAPIR) system. Digital Feature Analysis Data (DFAD) and Digital Terrain Elevation Data (DTED) are merged and displayed on the Analytical Photogrammetric Processing System (APPS) with stereographics superposition. The DLMS feature format encodes adjacent area features with digitized overlaps. L.N.K. Corporation has developed a software system for deleting these overlaps and transforming the digitized files into the AMS arc/node format. Some types of digitization errors are automatically detected and corrected in this process. Once the data has been brought into AMS, a powerful manual editing system can be used to correct, update, and enhance the files. Finally, the data can be brought back out of AMS and reformatted on a magnetic tape to DLMS specifications. Edited DLMS tapes have been created through this system and have been processed successfully on other installations. Portions of this report contain information proprietary to L.N.K. Corporation and are so marked.

ETL-0319

AD-B074 950

# TACTICAL/STRATEGIC POINT POSITIONING STUDY

November 1981

Autometric, Inc.

DACA76-80-C-0001

This report focuses on the current state-of-the-art high resolution synthetic aperture radar (HRR) systems and complementary use of other sensors systems such as the Precision Location Strike System (PLSS); examines how these systems are currently using DMA products; determines what system changes would be encountered if both the product and data bases were handled in digital rather than hard copy form; and finally, a breadboard system was designed that could be used to test the developed target location concept. This report concentrates on answering the highest system location accuracy needs using the PPDB.

ETL-0320

AD-A128 400

Barrón, Rosalinda P.  
Fox, Margaret F.

## BIBLIOGRAPHY OF IN-HOUSE AND CONTRACT REPORTS, SUPPLEMENT 11 AND INDEX FOR 1970-1983 March 1983

Author and title indexes are provided for the ETL "Bibliographies of In-House and Contract Reports." The indexes are designed to be used in conjunction with the 11 published bibliographies and refer to them by year and page: AD-877 653L (1970); AD-890 066L (1971); AD-905 548L (1972); AD-B005 275L (1975); AD-B010 642L (1976); AD-B019 966L (1977); AD-A055 468 (1978); AD-A068 744 (1979); AD-A084 111 (1980); AD-A099 803 (1981); AD-A113 006 (1982).

The indexes were prepared by the staff of the Scientific and Technical Information Center.



ETL-0321

AD-B078 164L

Bose, S.C.  
Brockstein, A.J.  
Buchler, R.J.  
Huddle, J.R.

**A STUDY TO OPTIMIZE PERFORMANCE  
OF THE RAPID GEODETIC SURVEY SYSTEM  
ADDENDUM REPORT  
February 1983**

Litton Guidance and Control Systems

DAAK70-80-C-0242

**Keywords:** Gravity Disturbance Vector Mapping, Inertial Instrument Stability Testing, Inertial Surveying, Simulation of Inertial Survey Systems, Two-Dimensional Smoothing.

The addendum study report summarizes work progress made on a study to optimize performance of the RGSS since the second interim report (ETL-0264, Litton 404595) was written. The study is directed at determining the system configuration and operational methods for system utilization in a regional survey project to obtain optimal performance goals. The near-term performance goals of 0.3 sec (RMS) for the vertical deflection and 0.5 milligal (RMS) for the gravity anomaly appear realizable by the existing equipment with installation of screened A1000 accelerometers in the level axes and utilization of screened G300G2 production gyros.

The ultimate performance goal of 0.1 sec (RMS) for the vertical deflection and 0.2 milligal (RMS) for the gravity anomaly also appears obtainable. Precise configuration of such a system requires quantification of the performance benefit of a Regional Adjustment Program (RAP) which combines the RGSS survey measurements from a number of survey traverses throughout a region.

This addendum study discusses test results utilizing A1000 accelerometers in the level axes.

ETL-0322

AD-A131 318

Faust, N.L.  
Rowan, M.J.

**FEED EVALUATION  
August 1983**

Georgia Institute of Technology  
(Engineering Experiment Station)

DAAK-70-81-F-0491

**Keywords:** Digital, Elevation, FEED, Terrain.

This report is an evaluation of the Field Exploitation of Elevation Data (FEED) as it relates to the expressed objectives. Software and hardware were considered.

ETL-0323

AD-A129 644

**RADAR BRIDGE PATTERNS EXTRACTION  
AND RECOGNITION**

Chen, Pi-Fuay  
Fox, Neil D.

April 1983

**Keywords:** Hough Transform, Image Edge Enhancement, Radar Feature Extraction and Recognition.

A technique is described for detecting and recognizing various bridge patterns with different orientation angles from a set of radar imagery. The algorithm combines Hough transform, Sobel edge operator, image thresholding methods, and decision logics and was implemented as a software for an experimental hardware system consisting of a 32-element by 32-element solid-state array, a minicomputer, and a computer-controlled translational stage. The resolution of bridge orientation angle detection was determined to be approximately 22.5 degrees for the current system setup. This resolution can be improved by enlarging the input measurement array size.

ETL-0324

AD-A130 744

**THE EFFECTS OF SOIL MOISTURE AND  
VEGETATION ON SURFACE TEMPERATURE**

Knoerr, K.R.  
Mowry, F.L.

April 1983

Duke University  
(The School of Forestry and Environmental Studies)

DAAK70-77-C-0210

This report from the Duke University test site augments data collected at the test site of the U.S. Army Engineer Topographic Laboratories (ETL). In an instrumentation sense the two sites are analogous. The Duke University site, however, can provide variations in vegetation cover, is large enough to approximate boundary-free conditions, and has individual test plots of sufficient size to be used in support of aircraft remote sensing missions. Thus, the general purpose of this analysis is to gain a better understanding of how the variable weather conditions in the eastern United States interact with the soil moisture content and the plant canopy temperature in determining the balance components of surface energy on a diurnal and longer periodic basis.

Falls, Robert A.

**USING TERRAIN ANALYSIS TO PREDICT  
LIKELY MINEFIELD SITES**  
May 1983

This document also serves as a supplement to the ETL series of Synthesis Guides that terrain analysts use for determining the effects of terrain on military operations.

**Keywords:** Avenue of Approach, Choke Point, Doctrine, Factor Overlay, Mine Warfare, Obstacle, Synthesis, Terrain Factor.

In the past, mine and minefield detection techniques were based on the assumption of reasonable access to mined areas. Recent advances in weaponry now impact severely upon the usefulness and accessibility of ground based, slow-moving mine detectors. As a result of this situation, priorities have been re-ranked to make stand-off detection of minefields of prime importance. In any standoff detection scheme it would be helpful to determine in advance the most likely minefield sites. This report provides a means to determine minefield sites based on consideration of terrain characteristics, mine doctrine and military objectives.

**EVALUATION OF PUBLISHED CRITERIA FOR  
IDENTIFYING METAMORPHIC ROCKS ON AIR PHOTOS:  
TWO CASE STUDIES IN THE NORTHEASTERN  
UNITED STATES**

Ehlen, Judy

May 1983

**Keywords:** Air photo patterns, Metamorphic rocks, Photo geology, Remote sensing.

Although there are stated Army needs for rock type information, there are as yet few reliable procedures for obtaining much of this information, particularly for metamorphic rocks, via remote sensing. Published criteria for identifying metamorphic rocks by air photo patterns were systematically tested on regionally metamorphosed rocks in west-central Vermont and near West Point, New York, and were found inadequate for use as predictive tools. Mapping units were discriminated on the air photos by evaluating the pattern elements of landform, drainage-plan, drainage-cross section, photo tone, and photo texture. They were identified by comparing each pattern element to its counterpart for each rock type in the published criteria. The most common pattern element rock name was selected as the name for the mapping unit. To avoid bias, geological data were not obtained until after the identification process was completed. The predicted rock names were then compared to geologic maps and field data to determine their accuracy. Only 20 of the 74 verifiable predictions were correct. Probable causes for these results are (1) that the published criteria are incomplete and internally inconsistent and do not include all the rock types found in the study areas; (2) that climatic and structural, or tectonic, factors, apparently not considered in the published criteria, play a significant role in determining rock type photo pattern; and (3) that the glacial history of these areas has affected the characteristic photo patterns of the rocks encountered. Moderate success was achieved, however, where lithologic diversity and structural complexity were low; when scales were 1:35,000 or larger; and with metamorphic rocks of higher grade and/or sedimentary origin. Similar techniques have proven successful for identifying igneous and sedimentary rocks on air photos, so development of more accurate criteria for metamorphic rocks, taking these factors into consideration, is continuing. These techniques are very useful in reconnaissance mapping, particularly in remote areas with difficult access.

ETL-0327

AD-B078 132L

**STUDY OF A DIGITAL INTERFACE DESIGN  
FOR THE QUICK RESPONSE MULTICOLOR  
PRINTER (QRMP)**

Green, L. Dale

April 1983

Xerox Corporation

DAAK-70-80-C-0112

**Keywords:** Color Digital Printing, Color Printing, Digital Map and Chart Printing, Digital Printing, Laser Beam Recording, Laser Xerography.

The Quick Response Multicolor Printer (QRMP) makes 24- by 30-inch reproductions of full color hardcopy originals in real time using a color xerographic printing system. It includes a laser scanning system to create the optical image for the xerography. With the addition of a Digital Interface, the QRMP can become a full color digital printer that makes copies of map products from appropriately formatted digital files. Digital data is fed directly to the printing portion of the QRMP. The Digital Interface can operate the QRMP without excluding the normal function of reproducing hard copy. It is possible to operate both simultaneously and combine a digital image with the hard copy image being scanned by the QRMP. The printed result might be an overlay created by a digital system combined with a reproduction of a map.

ETL-0328

AD-B074 231L

Butson, Philip  
France, Bernard  
Riley, David

**ELEVATION DATA EDIT TERMINAL**  
May 1983

DBA Systems, Inc.

DAAK70-80-C-0025

**Keywords:** Image Scanning System, Sensor Models, Photo to Display.

The "Elevation Data Edit Terminal" (EDET) is designed to present a superposition display of stereo graphics and stereo imagery utilizing Digital Terrain Elevation Data (DTED) which has been automatically compiled from stereo photo pairs.

Inputs to the EDET consist of the original imagery, the compilation model setup parameters and digital elevation data into the CPU. The interior orientation together with the setup re-establishes the compilation model which is confirmed by visiting control points included in the setup data. In a background computation, the elevation data is converted from Z with implied X and Y to film X/Y coordinates. This data is then transformed to display coordinates utilizing the same transfer function required to make anamorphic corrections to the stereo imagery. The resultant display provides anaglyphic superposition of nominal half-inch-square image patches with the stereo graphic elevation data. The EDET system editing functions then enable the operator to systematically review and correct where necessary the elevation data.

When editing has been completed for a model, the corrected data is converted to a new output tape in the same format as the original input tape.

ETL-0330

AD-A135 006

**APPLICATION OF A FEATURE SELECTION  
TECHNIQUE TO SAMPLES OF HIGH RESOLUTION  
SYNTHETIC APERTURE RADAR IMAGERY**

Hevenor, Richard A.

June 1983

**Keywords:** Feature Selection, Pattern Recognition, Radar Imagery.

A feature selection technique was applied to samples of synthetic aperture radar imagery. This technique was applied to four classes of terrain features on selected samples of radar imagery. The four classes considered were forest, cities, agricultural fields, and water. A feature vector was computed from samples of each class. A linear transformation was utilized to develop a new feature vector of reduced dimensionality. This transformation chooses those features that are most effective for performing class separability.

ETL-0331

AD-A132 401

**REFLECTION AND IDENTIFICATION STUDIES  
APPLIED TO TERRAIN IMAGING RADAR**

Jackson, Philip L.

June 1983

The University of Michigan  
(Department of Geological Sciences)

DAAK70-82-K-0100

**Keywords:** Fourier Transform, Radar Backscatter, Slope Effects, Synthetic Aperture Radar, Terrain Identification.

Two separate studies were undertaken. The first was concerned with the slope effects on backscatter of synthetic aperture radar (SAR). The imagery of a cinder cone (SP Mountain in northern Arizona), which has near-homogeneous surface roughness, was studied. The flight parameters of the imaging radar vehicle were found from the radar image and topographic data obtained from a 1:62500 map. The slant range radar image was converted to ground range with relief displacement rectified. The three-dimensional angle of incidence for each element was computed and plotted against the backscatter value. The average backscatter curve was a typical S-shaped pattern. With the techniques developed for the above, pseudo-SAR slant and ground range images were generated from the topographic data. The second study was concerned with the investigating discrimination techniques for uncultivated, agricultural, suburban and urban areas. The work was limited to the use of the Fourier transform. Optical transforms and Fast Fourier transforms were obtained of optically processed SAR imagery. This preliminary work showed distinct differences between uncultivated and cultural areas, but not between cultural areas.

Bedard, Roger J.  
Cynkin, Eugene B.  
Holmes, Kenneth G.  
Vivian, Howard C.  
Wilcox, Brian H.

**ROBOTIC VEHICLE TERRAIN-NAVIGATION  
SUBSYSTEM: CONCEPTUAL DESIGN PHASE  
November 1983**

California Institute of Technology  
(Jet Propulsion Laboratory)

**Keywords:** Autonomous Vehicles, Robotics, Route Planning, Stereo Display, Terrain Navigation, Topographic Data Bases.

The U.S. Army Engineer Topographic Laboratories (ETL) obtained the support of the Jet Propulsion Laboratory to develop a navigation subsystem conceptual design for a teleoperated robotic land vehicle. The primary constraints of this subsystem design were incorporation of ETL digital terrain-analysis technology; low technical risk of implementation to facilitate a system field demonstration in two years; and potential for evolution towards an autonomous land vehicle system, which is the long-term goal.

This report presents the results of the design effort and describes the Strawman Teleoperated Robotic Vehicle Demonstrator System, Strawman Demonstration Mission, Navigation Subsystem Requirements, and the Navigation Subsystem Conceptual Design. The Navigation Subsystem incorporates ETL terrain-analysis data base products for wide-area land navigation. Use of currently available technology and equipment for the subsystem components provides a high level of confidence that a system demonstration can take place in the near term; two years to implementation is feasible.

This subsystem concept establishes a basis for incorporating digital terrain-analysis technology into the navigation, guidance, and control functions of supervised autonomous land vehicles that are expected to evolve with development of appropriate technologies.



ETL-0333

AD-A134 977

Peroutky, James D.

**APPS-IV REMOTE SENSING  
APPLICATIONS GUIDE**  
June 1983

Autometric, Inc.

DAAK70-81-C-0261

**Keywords:** Aerotriangulation, Analytical Stereoplotters, Computer-Assisted Photo Interpretation, Digital Data Collection, Feature Analysis, Geographic Information Systems, Graphic Superposition, Remote Sensing.

This report describes the Computer-Assisted Photo Interpretation Research (CAPIR) facility at the U.S. Army Engineer Topographic Laboratories (USAETL) and discusses its use, primarily with the APPS-IV analytical stereoplotter, for various remote sensings applications. The components of the APPS-IV and the geographic information system (AUTOGIS) are described, followed by discussions of the capabilities and advantages of a CAPIR-type system. A general workflow is also included as a guide to the undertaking of this type project.

ETL-0335

AD-A137 977

Anderson, E.A.  
Jay, J.G.

**FEED SOFTWARE DOCUMENTATION**  
August 1983

Georgia Institute of Technology  
(Engineering Experiment Station)

DAAK70-82-K-0204

**Keywords:** Digital, Elevation, FEED, Software, Terrain.

This report provides programmer-level documentation which describes the FEED software, structure, files, data, and procedures.

ETL-0336

AD-A134 215

Peroutky, James D.

**APPS-IV CIVIL WORKS DATA EXTRACTION/  
DATABASE APPLICATION STUDY  
(PHASE II)  
September 1983**

Autometric, Inc.

DAAK70-81-C-0261

**Keywords:** Aerotriangulation Graphics Superposition, AMS, Analytical Stereoplotters, Computer-Assisted Photointerpretation, Digital Data Collection, Geographic Information Systems, Master Planning, MOSS, Wetlands Mapping.

This report describes Phase II of the APPS-IV Civil Works Data Extraction/Database Application Study. A Master Planning Demonstration Project was performed under military funding for the Seattle District COE, and a Wetlands Mapping Demonstration was performed as a Civil Works project for the Portland District COE. Both demonstration projects involved the use of AMS for aerotriangulation and digitizing, and MOSS for statistical analysis and output preparation.

ETL-0337

AD-A134 999

Rosenfeld, Azriel  
Samet, Hanan

**APPLICATION OF HIERARCHICAL DATA  
STRUCTURES TO GEOGRAPHICAL  
INFORMATION SYSTEMS (PHASE II)  
September 1983**

The University of Maryland  
(Computer Vision Laboratory)

DAAK70-81-C-0059

**Keywords:** Data structures, Geographical information systems, Quadtree editor, Quadrees, Query language, Storage management.

This document is the final report for Phase II of an investigation of the application of hierarchical data structures to geographical information systems. It describes a set of software tools developed for use with a quadtree encoded database containing area, point, and line data. Included in this software is an English-like query language, an editing capability to permit database updating; and a memory management system to allow manipulation of maps too large to fit into main memory.

ETL-0338

AD-A135 532

Bundy, Thomas R.

**HEXAGONAL DATA BASE STUDY**

September 1983

Interactive Systems Corporation

DAAK70-82-C-0133

**Keywords:** Automated mapping, Hexagonal data structures, Polygon processing.

This is a final report for a study in the application of hexagonal data structures to handling geographic information. This report presents the results of an experimental software implementation utilizing hexagonal data structures as applied to test data base.

ETL-0340

AD-B077 534L

Bohling, Edward

**VEGETATION DATA EXTRACTION SOFTWARE**

Powell, John

Documentation/User's Manual

Quinn, Thomas

August 1983

PAR Technology Corporation

DAAK70-82-C-0191

**Keywords:** Forest associated terrain elements, Forest theme, Golay processing, Image processing, Supervised/unsupervised image classification, Texture processing, Two-dimensional histogram, Vegetation classification.

Vegetation Data Extraction Software (VDES) was written for extraction of forest associated terrain elements and land/cover boundaries to run on the Remote Work Processing Facility. This document provides a software/system overview and a user's manual for the VDES interactive command menus. User interaction and optimized classification are provided via supervised or unsupervised image classification, Golay processing, texture processing, and two-dimensional histogram scatter plots.

**THE CLASSIFICATIONS OF METAMORPHIC ROCKS  
AND THEIR APPLICATIONS TO AIR PHOTO  
INTERPRETATION PROCEDURES**

Ehlen, Judy

September 1983

**Keywords:** Metamorphic Rocks, Photo Interpretation, Remote Sensing.

Although there are stated Army needs for rock-type information, there are as yet few reliable procedures for obtaining much of this information, particularly for metamorphic rocks, via remote sensing. The three common classifications of metamorphic rocks, i.e. textural facies, and formational, were evaluated in terms of their usefulness in predicting metamorphic rock types using air photo interpretation procedures. Areas in the northeastern United States containing a wide range of metamorphic rocks were selected as test areas. Predictions of rock type were verified by field reconnaissance and comparison to geologic maps. Although none of the three classifications were found adequate for use on air photos, the results of this study indicate that the potential for successfully predicting metamorphic rock types by air photo interpretation procedures exists. The textural classification was found most useful, primarily because criteria for identifying metamorphic rocks on air photos using this classification were developed previously. Although using the facies classification has potential, it is unlikely that it can be used routinely in conjunction with air photo interpretation procedures because of the high degree of skill required to identify metamorphic facies. The formational classification was found to be useful because it identifies metamorphic rocks by mapping unit, but it does not provide a mechanism for naming the rock units.

ETL-0343

AD-A138 366

**FEATURE ANALYSIS AND REDUCTION  
OF LAWS TEXTURE MEASURE**

Rand, Robert S.  
Shine, James A.

October 1983

**Keywords:** Bayes Classifier, Digital Imagery, Divergence, Laws Texture Measure, Pattern Recognition, Principal Components.

The Laws Texture Measure was tested in an autoevaluation experiment and compared to some of the texture measures previously studied at ETL. In addition, four methods of component reduction were evaluated. Laws Texture was found to be the most effective measure for identifying a Buildings/Roads class; however, it was less effective on other classes. A technique that transforms the original components into principal components and then arranges the transformed components in an order that maximizes the divergence was selected as the most effective component reduction method.

ETL-0345

AD-A134 998

**A TEST STRATEGY FOR HIGH  
RESOLUTION IMAGE SCANNERS**

Gruen, Armin W.

October 1983

The Ohio State University  
(Department of Geodetic Science and Surveying)

DAAG29-81-D-0100

**Keywords:** Dynamic range, linearity, noise, Dynamic scanning errors, Flare light, coherency effects, Geometrical and radiometric performance, High Resolution Image Scanner, Length and linearity of array line, MTF, Response uniformity, Skewness of array line, Temporal stability.

The scope of this study is the design of a device-independent test strategy for performance tests of the AIDS (Advanced Image Digitizing System) scanner. Major system characteristics to be tested are the geometrical accuracy, linearity of gray shade response, MTF, and resolution of the output. Other parameters addressed here are dynamic range, noise, response uniformity, flare light, coherency, and temporal stability. Test standards are suggested and data processing aspects are considered for both the geometric and radiometric tests. The recommended test strategy is finally summarized in table format.

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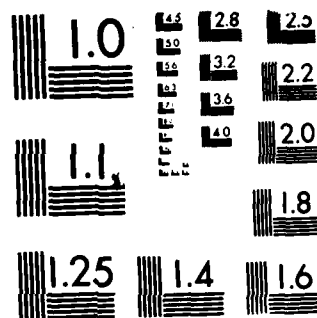
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